TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC7WH125FU, TC7WH125FK

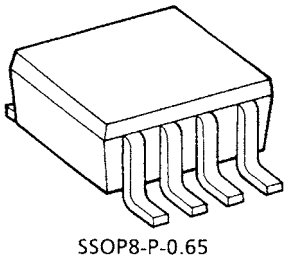
Dual Bus Buffer with 3-STATE Output

Features

High speed t_{pd} = 3.8 ns (typ.) at V_{CC} = 5.0 V, C_L=15pF

- Low power dissipation: ICC=2μA (max.) at Ta = 25°C
- High noise immunity : $V_{NIH} = V_{NIL}$ = 28%Vcc (min.)
- 5.5-V tolerant inputs
- Wide operating voltage range: V_{CC} = 2.0 to 5.5 V
- Low Noise : V_{OLP} = 0.8V(max.)

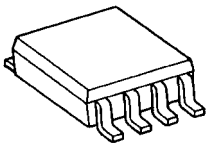
TC7WH125FU



SSOP8-P-0.65

(SM8)

TC7WH125FK

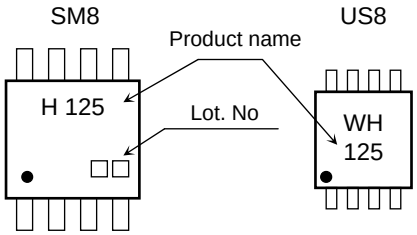


SSOP8-P-0.50A

(US8)

Weight
SSOP8-P-0.65 : 0.02 g (typ.)
SSOP8-P-0.50A : 0.01 g (typ.)

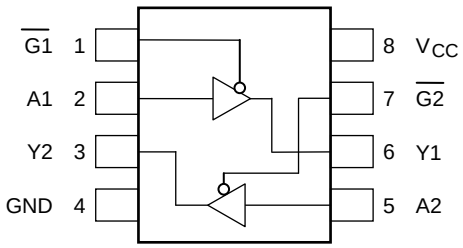
Marking



Absolute Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC}	−0.5 to 7.0	V
DC input voltage	V_{IN}	−0.5 to 7.0	V
DC output voltage	V_{OUT}	−0.5 to Vcc + 0.5	V
Input diode current	I_{IK}	−20	mA
Output diode current	I_{OK}	±20 (Note 1)	mA
DC output current	I_{OUT}	±25	mA
DC V_{CC} / GND current	I_{CC}	±50	mA
Power dissipation	P_D	300 (SM8) 200 (US8)	mW
Storage temperature	T_{stg}	−65 to 150	°C
Lead temperature (10s)	T_L	260	°C

Pin Assignment (top view)



Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook (“Handling Precautions”/“Derating Concept and Methods”) and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

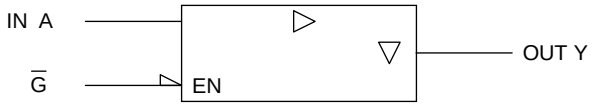
Note 1: V_{OUT} < GND,V_{OUT}>V_{CC}

Truth Table

$\overline{G}$	A	Y
H	X	Z
L	L	L
L	H	H

X: Don't Care
Z: High impedance

IEC Logic Symbol



Operating Ranges

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC}	2.0 to 5.5	V
Input voltage	V_{IN}	0 to 5.5	V
Output voltage	V_{OUT}	0 to V_{CC}	V
Operating temperature	T_{opr}	−40 to 85	°C
Input rise and fall time	dt/dv	0 to 100 (Vcc=3.3±0.3V)	ns/V
		0 to 20 (Vcc=5.0±0.5V)	

Electrical Characteristics

DC Characteristics

Characteristics		Symbol	Test Condition		V_{CC} (V)	Ta = 25°C			Ta = −40 to 85°C		Unit
						Min	Typ.	Max	Min	Max	
Input voltage	High level	V_{IH}	—		2.0	1.5	—	—	1.5	—	V
					3.0 to 5.5	$V_{CC} \times 0.7$	—	—	$V_{CC} \times 0.7$	—	
	Low level	V_{IL}	—		2.0	—	—	0.5	—	0.5	
					3.0 to 5.5	—	—	$V_{CC} \times 0.3$	—	$V_{CC} \times 0.3$	
Output voltage	High level	V_{OH}	V_{IN} = V_{IL} or V_{IH}	I_{OH} = −50 μA	2.0	1.9	2.0	—	1.9	—	V
					3.0	2.9	3.0	—	2.9	—	
					4.5	4.4	4.5	—	4.4	—	
				I_{OH} = −4 mA	3.0	2.58	—	—	2.48	—	
				I_{OH} = −8 mA	4.5	3.94	—	—	3.8	—	
	Low level	V_{OL}	V_{IN}= V_{IL}	I_{OL} = 50 μA	2.0	—	0.0	0.1	—	0.1	
					3.0	—	0.0	0.1	—	0.1	
					4.5	—	0.0	0.1	—	0.1	
				I_{OH} = −4 mA	3.0	—	—	0.36	—	0.44	
				I_{OH} = −8 mA	4.5	—	—	0.36	—	0.44	
3-state output off-state current		I_{OZ}	V_{IN} = V_{IH} or V_{IL} V_{OUT} = Vcc to GND		5.5	—	—	±0.25	—	±2.5	μA
Input leakage current		I_{IN}	V_{IN} = 5.5V or GND		0 to 5.5	—	—	±0.1	—	±1.0	μA
Quiescent supply current		I_{CC}	V_{IN} = V_{CC} or GND		5.5	—	—	2.0	—	20.0	μA

AC Characteristics (unless otherwise specified, Input: $t_r = t_f = 3$ ns)

Characteristics	Symbol	Test Condition			Ta = 25°C			Ta = −40 to 85°C		Unit
			V_{CC} (V)	CL(pF)	Min	Typ.	Max	Min	Max	
Propagation delay time	t_{pLH} t_{pHL}		3.3±0.3	15	—	5.6	8.0	1.0	9.5	ns
				50	—	8.1	11.5	1.0	13.0	
			5.0±0.5	15	—	3.8	5.5	1.0	6.5	
				50	—	5.3	7.5	1.0	8.5	
3-State Output enable time	t_{pZL} t_{pZH}	R_L = 1 kΩ	3.3±0.3	15	—	5.4	8.0	1.0	9.5	ns
				50	—	7.9	11.5	1.0	13.0	
			5.0±0.5	15	—	3.6	5.1	1.0	6.0	
				50	—	5.1	7.1	1.0	8.0	
3-State Output disable time	t_{pLZ} t_{pHZ}	R_L =1 kΩ	3.3±0.3	50	—	9.5	13.2	1.0	15.0	ns
			5.0±0.5	50	—	6.1	8.8	1.0	10.0	
Output to Output Skew	t_{osLH} t_{osHL}	(Note 2)	3.3±0.3	50	—	—	1.5	—	1.5	ns
			5.0±0.5	50	—	—	1.0	—	1.0	
Input capacitance	C_{IN}				—	4	10	—	10	pF
Output capacitane	C_{OUT}				—	6	—	—	—	pF
Power dissipation capacitance	C_{PD}			(Note3)	—	14	—	—	—	pF

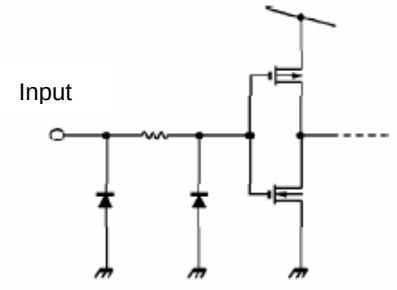
Note 2: Parameter guaranteed by design. $t_{osLH} = |t_{pLHm}-t_{pLHn}|$, $t_{osHL} = |t_{pHLm}-t_{pHLn}|$

Note 3: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.
Average operating current can be obtained by the equation:
$I_{CC\ (opr.)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/2$

Noise Characteristics (Ta=25°C, Input tr= tf = 3n)

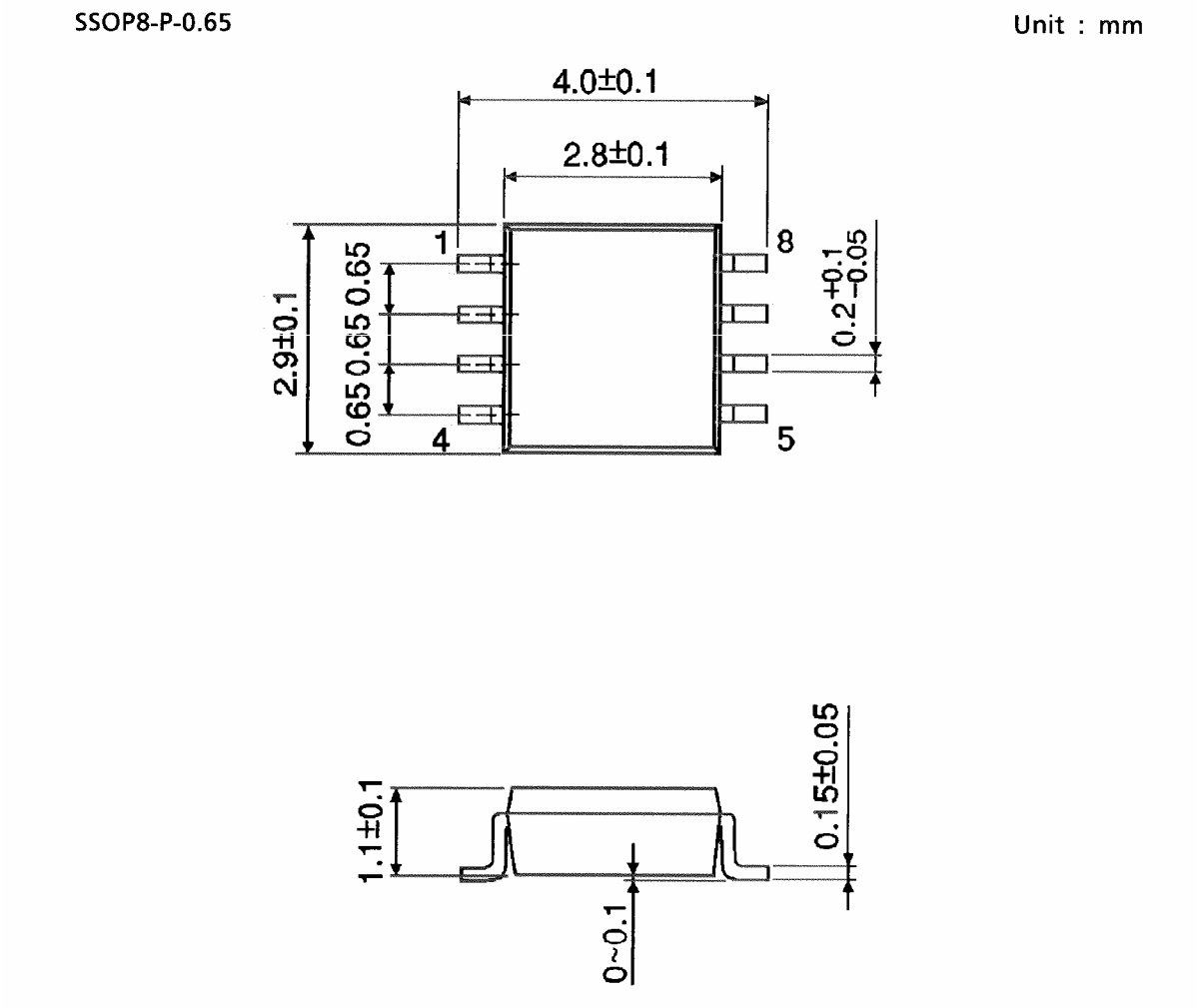
Characteristics	Symbol	Test Condition		Typ.	Limit	Unit
			V_{CC}(V)			
Quiet Output Maximum Dynamic V_{OL}	V_{OLP}	C_L = 50pF	5.0	0.3	0.8	V
Quiet Output Minimum Dynamic V_{OL}	V_{OLV}	C_L = 50pF	5.0	-0.3	-0.8	V
Minimum High Level Dynamic Input Voltage	V_{IHD}	C_L = 50pF	5.0	—	3.5	V
Maximum Low Level Dynamic Input Voltage	V_{ILD}	C_L = 50pF	5.0	—	1.5	V

Input Equivalent Circuit



Package Dimensions

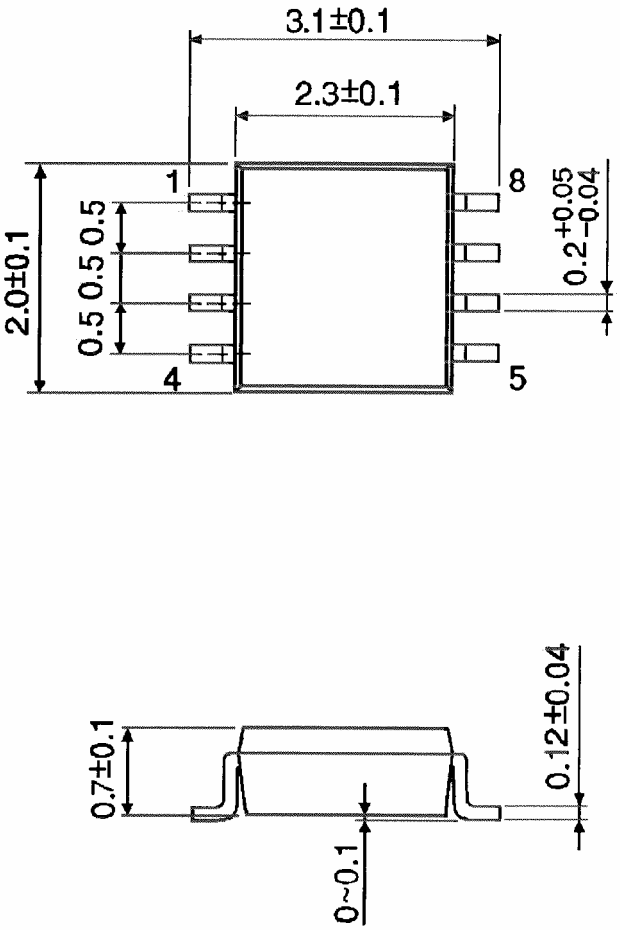
SSOP8-P-0.65 Unit : mm



Weight: 0.02 g (typ.)

Package Dimensions

SSOP8-P-0.50A Unit : mm



Weight: 0.01 g (typ.)

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